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BACTERIAL CELLULOSE PRODUCTION AND CARBOXYMETHYLATION

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Abstract. Bacterial Cellulose (BC) was produced using a symbiotic culture of *Komagataeibacter xylinus*; optimal conditions for BC assembly was attuned. Later on, carboxymethylation of BC was attempted for further production of microgel.

Cellulose is a natural polymer; which is composed of glucose monomers connected by β (1–4) glycosidic linkages, and its chemical formula is $(C_6H_{10}O_5)_n$. Cellulose forms the basic structural foundation of the cell wall of eukaryotic plants and algae, also it is found as a major constituent of the cell wall of fungi. The increased demand of cellulose based products for a wide range of industrial and biomedical applications has resulted in extreme negative pressure on the delicate ecological balance of ecosystem causing deforestation and creating global environmental issues. However, this form of cellulose contains many impurities, including distinctive natural elements as hemicellulose, lignin, ash, pectin, wax and extractives. Harsh chemical treatments are required to remove these impurities which result in irreversible changes in cellulose structure and permanently strip the polymer of its useful characteristics. Research has now been directed towards cellulose production from alternative sources. Reports have suggested that bacterial cellulose (BC) can be one of the most promising biomaterials, displaying improved properties over plant cellulose such as higher purity, crystallinity, water absorption, tensile strength, low degree of polymerization and stronger biological adaptability.

Bacterial cellulose is widely used in various areas of the food industry. It is used in the form of gelatinous translucent food additive; as a thickener, stabilizer, texturizer, dietary fiber and/or a calorie reducer due to its fiber content. Cellulose can be modified chemically to produce derivatives which are widely used in various industrial sectors in addition to traditional applications. Five important roles of the chemically modified cellulose derivatives in food industry are to organize the flow properties, emulsification, stability of foam, modification of ice crystal formation, ability to bind water. The applicability of the cellulose derivatives of certain food applications can be chosen with respect to physical and chemical characteristics.

Cellulose ethers; unlike cellulose, are water soluble. They promote emulsification by focusing on the oil-water interface and providing a barrier of hydrated polymer, which inhibits flocculation and coalescence of oil droplets. As well, it can diminish syneresis which is a sharp flaw during iterative freeze–thawing processes. They can also improve the viscosity of emulsified food products for better organoleptic properties. Carboxymethyl cellulose (CMC); which belongs to the family of cellulose ethers, was attempted using BC, 30 wt.% NaOH and monochloroacetic acid.